Study on practical teaching of programming course in higher vocational college based on ACM mode

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ABSTRACT

Programming course is an important foundation course in higher vocational college. According to the analyses of the current practical teaching and study status of programming course, six types of practical teaching methods are presented based on ACM mode. They are collaborative learning, task driven teaching, online teaching, competitive teaching, open teaching, and innovative teaching. The points for attention about selection of practical project, the construction of teachers, and evaluation mechanism in practical teaching management, are also emphasized.

Key words: Higher vocational college; Computer; ACM; Programming; Practical teaching

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INTRODUCTION

Programming course is a basic course for computer specialty. It is core of the computer courses. Computer specialty in higher vocational colleges generally offers many programming courses, such as C programming language, VB object-oriented programming, JAVA programming, SQL, ASP webpage programming, flash script language, etc. Programming course in higher vocational colleges generally includes theory teaching part and practice teaching part. Theory teaching is to teach programming syntax and format, while practice teaching focuses on training designing idea and program debugging ability of students. Theory teaching is relatively simple, but it is not a short duration of time to learn how to apply theory to practice and train designing ideas from it. "Language is the carrier while thought is the soul." The introduction of ACM mode of practice teaching helps students play to their initiative and learn program design course better, so as to guide the students to gradually establish program designing idea.

STUDY BACKGROUND

I Practical Teaching Status Quo

It is found in the investigation and visit of vocational colleges' graduates and trainees of computer specialty that

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many employers think that most of the professional skills of the students are weak, and the ability is not strong enough. As a foundation course, whether the programming course has been mastered or not, directly relates to the professional skills of the students. In the daily teaching, because of their relatively weak basis, the majority of college students have feelings of difficult course and boring knowledge points in learning of programming course. When students feel difficult to complete the teaching task, they produce the fear of difficulty to the course and give up learning. Effect on subsequent learning is quite large. However, a few outstanding students consider practical task is too simple. The early completion of the mission makes them have nothing else to do. Their interest is not excited. They lack of learning motivation, and they have limited room for improvement.

Programming design is a very practical course. Only through a lot of hands-on programming, students can acquire knowledge and enhance the ability. How to make students like programming? Interest. How to cultivate the interest of students? Starting from the external power, create the environment, atmosphere, and gradually arouse students' internal motivation. That is to say, through the practice of teaching, improving the quality of teaching, making students actively, continuously involved in the practice courses in computer programming, is very necessary.

II ACM Contest

ACM International Collegiate Programming Contest (ACM/ICPC) is organized by the world authority ACM (Association for Computing Machinery). ACM is recognized as the world's largest scale, and the highest level of International Collegiate Programming Contest. It was dubbed "the honorific title of program design of the Olympic". (Zeng, 2008)

ACM is a group competition, and each team consists of three players. In five hours of play time, three members of each team to share one computer, use C, C++, Pascal or Java to solve eight or ten problems according to the requirements. Each solution will be submitted to online judging system and the results will be judged as right or wrong. If a team completes a problem correctly, the organizers will raise a balloon whose color is corresponding with the problem in its position. The winner is the team whose correct answers are the most and the total time is the least.

III Study Status

Influence of ACM competition in the global scope is very great. More and more domestic universities are participated in the competition. Many higher vocational colleges are also active. They choose outstanding students to be involved in similar contests. However, only a small part of excellent students take part in the contests. For higher vocational college, to get good result in the contests is not the main purpose. The main purpose is to drive all computer students actively involved in the programming course of study, led by these excellent students. Therefore, ACM mode should be integrated into the practical teaching of computer programming course so that the cultivation of innovative talents will expand coverage to all students. In the meantime, colleges select talented students for high level competitions.

Attention at home and abroad about ACM has mostly focused on how to solve the problems, how to train, how to play to a better level in the competition. The study on the combination of ACM and teaching mostly analyzed the application of ACM platform in vocational computer programming courses, or how to take advantages of ACM online evaluation system. The studies on how ACM mode applies to practical teaching of computer specialty in higher vocational colleges are still insufficient.

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PRACTICAL TEACHING BASED ON ACM MODE

To maximize the initiative of students in learning, practical teaching of programming course should be adjusted. The essence part of ACM mode is absorbed and is integrated with practical teaching.

I Collaborative Learning

Collaborative learning is a strategy for learning by groups of students. Cooperative work of team members is an integral part of the class learning objectives. Individuals (students) in team collaboration activities can share the information and learning materials explored in the learning process with other members of the team , and even with other groups or the whole class.(Zhao, 2000) Wang Tan thinks, collaborative learning is based on modern social psychology, educational sociology, cognitive psychology, and modern education technology theory. It uses group performance as evaluation standards. Its education aim is to improve the academic performance of students, improve the classroom learning atmosphere, and form good psychological quality and social skills. Collaborative learning is a kind of creativity and aging educational theory and strategy system. (Wang, 2002)

During ACM contest, team members need a reasonable division of tasks, a high level of cooperation, with the fastest speed to find the best solution to the problem. In practical teaching, members work together as a team to accomplish tasks with this mode of learning. At this time, the relationship between members changes from the original separate entity into companions helping each other. This change reduces the learning difficulty, eliminates their fear of difficulty to a certain extent, and avoids the students lacking of self-confidence caused by students' level difference, also causes the student become more positive, active and efficient in the learning activities. Students who study better learn error correction and cement their knowledge while helping companions. Weak students finish the task successfully on time in the peer help. They narrow the gap in helping each other, and the learning interest is enhanced. Certainly, members of the group are matched with their consent so as to obtain reasonable collocation and complementary advantages between different temperaments, different personalities, and different mind habits of students.

II Task Driven Teaching

Constructivism holds that learners have the ability to use the existing experience to make their own cognitive structure reorganization and change in the process of learning. Study is not a passive process, but a process of active construction of knowledge on the basis of the existing knowledge. At the same time, learning is situational. It is more helpful for the learner to acquire cognitive and skills, develop ability in problem situation. (He, 1998) According to the constructivism learning theory, task driven teaching can make full use of their existing knowledge and experience. Task driven teaching can also stimulate the students' spirit of exploration in the specific scenario problems, help students acquire knowledge and skills in the process of completing a specific task.

The tasks to be completed must be clear, realistic, challenging. In ACM contest, every problem is a real task. Tasks in the contest are relatively complex and great comprehensive. In practical teaching, tasks can be simplified according to the actual level of students. Students make their learning goals clear in the analysis of problems. They will be full of enthusiasm to study in exploring the problems. They can obtain the sense of achievement after solving the problems. In this way, the students can form a good habit of active learning gradually.

III OnlineTeaching

After 30 years of development, at home and abroad, many universities have established ACM online platforms,

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providing a large number of open questions and learning resources, such as Peking University ACM site, Zhejiang University ACM site, Hangzhou Dianzi University ACM site, Universidad de Valladolid ACM site in Spain , etc. Through online training, students get more programming experience and latest programming technology, without the single content in the traditional experimental teaching or disconnect with the real needs of social situation. Students can also communicate with enthusiasts of other universities through the forum in platforms. In their encouragement, students develop the self-study ability and obtain self-growth. The ACM platform also provides real-time ranking function. With the increase of the number of problem solving, and the rising of ranking, the students' sense of achievement is stronger and stronger, and their learning enthusiasm will be lit. Students will participate on practical learning of programming course actively and constantly.

IV Competitive Teaching

Competition itself is glamorous. Using the students' ambition, competition integrated into teaching not only can improve students' learning efficiency, but also can make the teaching process become much more attractive. The way of competition is to be the most changeful. Competition can be carried out between the groups, or among team members, and even with the students themselves. It may be rush-in-answer, or online competition. The scope of competition problems can be limited to the content of one unit, one course, or even multi courses. The type of the problems is flexible according to the levels of the students. The type of the problems with low point difficulty can be multiple choice, fill-in-the-blank, or error correction. Problems with slightly higher difficulty are validation ones of programming. More difficult one is creative and comprehensive programming. Among all the problems, the most difficult one is group competition through the network platform based on ACM mode, which tests the students' ability to solve the actual problem and their team cooperation spirit, cultivates students' innovation ability, and improves students' comprehensive quality.

V Open Teaching

To truly master the programming course, relying on the practical teaching in the teaching plan is far from enough. With the aid of the network platform, the centralized teaching in class can be extended to open teaching. Higher vocational college students are lack of programming idea. Teachers can choose some classical or interesting program for students to analyze and discuss to cultivate students interests in program design. Students are free to choose the time and the level. Thus, the initiative of students is maximized, and their ability of independent innovation is developed.

VI Innovative Teaching

Zhu Yongxin thinks, innovation education is a kind of education theory and method whose main target is to cultivate students' creative consciousness, innovative thinking, innovative ability and innovative personality according to the principle of innovation. (Qian & Ma, 2002) Programming practice itself is a creative process. To complete the tasks, students work in teams according to ACM mode and competition is carried on between groups. How to analyze and solve problems, how to avoid weaknesses, how to share out the work and cooperate with one another is fully negotiated by the students themselves. Students are encouraged to try to find a variety of solutions to the problem. Teacher provides assistance only when appropriate. The innovation ability of students is continuously developed in the process of solving problems and completing tasks.

To be sure, the above teaching methods can be used independently or simultaneously. And, theory and practice should be combined effectively. After teaching theoretical part, there are always a few students who have not yet fully mastered the theoretical knowledge. Joining in practice with a problem, and understanding of theoretical

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knowledge in practice, will help students achieve better effect. In the practice teaching, teachers should pay attention to the design idea and method, so that students are able to understand the theory of programming knowledge better. Through practical teaching based on ACM mode, students build a solid professional basis, and their teamwork spirit is quite good. Ability to analyze and solve problems is enhanced as well. Students have the characters of active exploration, innovation, perseverance, etc. They have got great development potentiality and employment advantage. Enterprises provide colleges with real cases, and provide the practice opportunity for the students. Colleges provide talents for enterprises. The students of different colleges use the same platform, which promote the exchanges and learning between students. Thus it achieves a "win-win" situation.

POINTS FOR ATTENTION IN THE PROCESS OF PRACTICAL TEACHING MANAGEMENT

I Selection of Practical Project

The selection of practical project is very important. It is the key to carry out practice teaching successfully. If the practical project is too simple, the students will feel a sense of accomplishment deficiency. If too abstract, it is difficult to arouse students' enthusiasm for learning. If too complex, students can easily have the fear of emotions. When selecting the practical project, it is suggested, first, the topic should be drawn from life or business case on the principle of authenticity and practicality; Second, dividing the complex problem into several small problems, will help students solve the problem better; Third, project should not be confined to a certain knowledge point of one course. Integrating several courses is helpful to cultivate students' comprehensive quality.

II the Construction of Teachers

Practical teaching based on ACM mode is different from traditional teaching. Its depth and breadth of content involves much higher than traditional teaching. Because of the significantly different levels of students, the practice is also different from each other. In traditional teaching, teachers can grasp the basic teaching situation by correcting homework or test report. But in the new practice teaching, to grasp the practice of each student is considerable difficult. According to the differences of students, setting different levels, different types, different quantity, different process practice, even increases the organization difficulty and teaching difficulty. All of those set higher requirements for teachers. Teachers should have strong guidance ability, and constantly update their knowledge structure, in-depth study of the teaching reform, speed up the individual professional growth, enhance the comprehensive quality of themselves, strengthen cooperation symposium in order to guide the students' autonomous learning, promote the students' friendly cooperation, encourage students to solve problems, and arouse the students' competition atmosphere. Teachers provide assistance if necessary to help them complete practical tasks successfully.

III Evaluation Mechanism

A positive evaluation mechanism is helpful to arouse the enthusiasm, to maintain a strong interest in learning, to produce a powerful driving force for subsequent learning of students. (Xie, 2010) In his theory of multiple intelligences, Howard Gardner identified seven intelligence types. He thinks that human intelligence is mainly composed of seven relatively independent intelligence types, which are linguistic intelligence, musical intelligence, logical mathematical intelligence, pattern intelligence, body coordination intelligence, interpersonal intelligence, and intrapersonal intelligence. These intelligence types have the corresponding locations in the brain and nervous system. (Gardner, 2000)

According to this theory, scientific and reasonable course evaluation should evaluate students in different aspects. First, the combination of process evaluation and final evaluation is recommended. Process evaluation should be

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primary. Knowledge and ability of students is directly reflected in the process of practice. Process evaluation can encourage students to take every practice more seriously. In the past, students can easily pass exams as long as they recite before exams. By using process evaluation, it is impossible for students to pass exams easily if they don't work hard in the process of practice. Second, the combination of peer evaluation, self evaluation and teacher evaluation is recommended. Peer evaluation should be primary. In practice, group members know about each other very well. Teachers should believe they can make a fair evaluation. Students learn to reflect in the evaluation. They learn to study and improve management skill in the reflection. The ability of autonomous learning will be enhanced because the teacher let go. Third, the combination of formal evaluation and informal evaluation is recommended. The formal evaluation is scores or grades in accordance with the provisions for teaching evaluation. Informal evaluation can be freely interspersed in the daily teaching process. As long as the student is found that there is progress in one hand, the teacher should not stingy praise. The teacher's words, may affect the student's life. Incentive evaluation, whether oral or written, let students feel pleasure, and stimulate their desire to learn.

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